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BEFORE THE ARIZONA CORPORATION COMMISSION

IN THE MATTER OF THE APPLICATION OF ALLEGHENY ENERGY SUPPLY COMPANY, LLC FOR A CERTIFICATE OF ENVIRONMENTAL COMPATIBILITY FOR CONSTRUCTION OF A 1,080 MW (NOMINAL) GENERATING FACILITY IN SECTION 35, TOWNSHIP 3 NORTH, RANGE 11 WEST IN LA PAZ COUNTY, ARIZONA AND AN ASSOCIATED TRANSMISSION LINE AND SWITCHYARDS BETWEEN AND IN SECTION 35, TOWNSHIP 3 NORTH, RANGE 11 WEST AND SECTIONS 23-26, TOWNSHIP 3 NORTH, RANGE 11 WEST ALSO IN LA PAZ COUNTY, ARIZONA.	Docket No. L-00000AA-01-0116 Case No. 116 **AZURE'S BRIEF IN SUPPORT OF REQUEST FOR REVIEW OF CERTIFICATE OF ENVIRONMENTAL COMPATIBILITY**

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I. INTRODUCTION AND SUMMARY.

In determining whether to confirm, deny, or modify the Certificate of Environmental Compatibility ("CEC") issued by the Power Plant and Transmission Line Siting Committee ("Committee"), the Commission must "comply with the provisions of [Arizona Revised Statutes] section 40-360.06," and "balance, in the broad public interest, the need for an adequate, economical and reliable supply of electric power with the desire to minimize the effect thereof on the environment and ecology of this state." (Ariz. Rev. Stat. § 40-360.07(B).) The Commission must conduct its review of the CEC "on the basis of the record" before the Committee. (*Id.*)

In this case, the record establishes: (1) there is no need whatsoever for the La Paz Generating Facility ("project") to ensure an adequate, economical, and reliable energy supply in Arizona; (2) on the contrary, the project will actually impair the reliability of the existing transmission system by aggravating congestion at the Palo Verde hub; and (3) as approved by the Committee, the project will needlessly consume or degrade Arizona's water resources, biological resources, air quality, and public health. However, the record also establishes that many of the project's impacts on natural resources and the environment can be reduced or avoided simply by using the same mitigation measures that other combined-cycle merchant power plants throughout the West use routinely. These measures include:

- **A dry cooling system**, which would reduce the project's need to pump groundwater from the Harquahala aquifer by as much as 95 percent. This would not only avoid the unnecessary consumption of increasingly scarce fresh water resources, but would eliminate any adverse drawdown and subsidence impacts in the aquifer as well.[1]

- **A zero liquid discharge crystallizer system** ("ZLDC"), which would eliminate the need to discharge cooling tower blowdown into sixty acres of open-air evaporation ponds. This would eliminate the significant risk of harm to birds and wildlife from exposure to the toxins in the ponds.

- **Lowest achievable emission rate ("LAER")** air pollution limits, which would protect air quality while minimizing haze formation and other visibility impacts in the several wilderness areas that surround the site.[2]

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[1] Committee Chair Woodall and Commission designee Williamson both voted to impose a dry cooling condition. (Reporter's Transcript ("RT"), Vol. IX *Deliberations and Voting* at 50:22-24.)

[2] Commission designee Williamson voted to impose a LAER condition. (RT Vol. IX, at 44:13-14.)

- **A urea-to-ammonia ("U2A") generation system**, which can produce ammonia for the project's selective catalytic reduction ("SCR") system on-site, on an as-needed basis, thereby avoiding the public health risks associated with transporting aqueous ammonia on the state's public roads.

Finally, the record also establishes that all of these measures are technically and economically feasible for this project, just as they are for other similar projects using them now.

Based on this record, the outcome of the statutory balancing is clear: if the Commission is to approve this unnecessary and environmentally deleterious project at all, it should impose conditions to minimize or avoid environmental impacts and consumption of scarce natural resources to the maximum extent feasible. Since the public does not need this power plant, and will likely suffer reliability impairment if it is built, there is no reason for the public to sacrifice its natural resources and environmental quality any more than absolutely necessary. Any impacts that can be avoided must be avoided. The Commission should therefore modify the CEC to require each of the foregoing measures, together with any others it deems appropriate. Arizonans present and future deserve nothing less.

II. THE PROJECT IS NOT NEEDED, AND WILL JEOPARDIZE THE RELIABILITY OF ARIZONA'S TRANSMISSION SYSTEM.

There is no direct evidence of any kind in the record that Arizona needs this project. As in the recent Toltec proceeding (Case No. 113), the applicant has not demonstrated that it has obtained contracts or other commitments for the sale of the project's output. The project is entirely speculative, premised on a blithe assumption that if it is built, the buyers will come. As the Commission has made clear in past proceedings, however, speculative assumptions do not equate to showing of need. Furthermore, as described below, the generating capacity already under construction in Arizona is more than sufficient to meet projected load growth in Arizona for the foreseeable future.

A. The Project Is Not Needed For Reliability Either In Arizona Or The WSCC Subregion.

Energy resource economist David Marcus testified for AZURE regarding the need for this project. Mr. Marcus holds a Master's degree from U.C. Berkeley's prestigious Energy & Resources Group, and has over 20 years of experience as a private energy consultant. (*See* Marcus résumé, Exh. I-16.) Mr. Marcus is a former staff member and advisor at the California Energy Commission, and has

worked as a consultant for the Bechtel Power Company. (*Id.*) Mr. Marcus presented both oral and written testimony. (*See* Exhs. I-16, I-21.).

Mr. Marcus reviewed the most current Western States Coordinating Council ("WSCC") projections of load growth rates in Arizona and the WSCC subregion containing Arizona, together with current data on new power plant construction and licensing in Arizona, Nevada, and California. Mr. Marcus explained that these materials show that in Arizona, new projects already under construction alone are more than enough to ensure reliability through 2008, while also providing a healthy competitive margin. (1116:14-18.)[3] Furthermore, if all projects currently in licensing are built, they will generate *five to six* times more power than necessary for reliability. (1116:10-13.)

Mr. Marcus explained in detail how the data support these conclusions. Specifically, the WSCC projects that load growth in Arizona will be approximately 3,500 MW through 2007. (1120:1-3.) Assuming an additional 15 percent reserve margin, and even adding an additional 1,000 MW for safety, the state will require an additional **5,000 MW** over the next five years. (1120:4-8.) Currently there are over **5,700 MW** under construction in Arizona, with another **4,300 MW** already approved by the Commission and/or Committee. (1120:8-12; Exh. I-16, p. 2; Exh. I-21.) Even if none of these approved projects is built, the projects currently under construction, by themselves, will provide both reliable service and an extra 10 percent competitive reserve. (1120:15-21.) Based on these facts, Mr. Marcus concluded that there is no need whatsoever for this project's 1,080 MW to ensure reliability in Arizona. (Exh. I-16, p. 2.)

The data also show that the project is equally superfluous from a regional standpoint. Mr. Marcus testified that within the WSCC Arizona/New Mexico/Southern Nevada subregion, current forecasts show peak firm load growth of 6,957 MW from 2001 to 2010. (Exh. I-16, p. 2.) Projects under construction in Arizona, New Mexico and Southern Nevada projects, which are scheduled to come online over the next 30 months, total over 7,600 MW. (*Id.*) This total does not include the 4,300 MW already licensed by the ACC but not yet in construction, or the over 8,000 MW of Southern Nevada

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[3] All further page and line references are to the serialized Reporter's Transcript (which excludes Volume IX, *Deliberation and Voting*) unless otherwise indicated.

and New Mexico projects currently in development but not yet under construction, or any of the more than 5,000 MW of other projects in Arizona currently before the ACC. (Exh. I-16, p. 2.) Again, the projects now under construction alone are enough to carry the entire subregion through the decade.

In sum, if the La Paz project were not built, there still would be ample generation capacity to satisfy projected load growth for more than a decade, both in Arizona and throughout the western subregion, while also assuring a robust competitive margin. Thus, the absence from the record of any evidence that the applicant has obtained contracts or other firm commitments for the project's output is hardly surprising.

B. The Project Will Impair System Reliability By Aggravating Congestion At The Palo Verde Hub.

Mr. Marcus also testified regarding the project's impacts on Arizona's transmission system. Commission Staff expert Jerry Smith also testified on this topic. Both witnesses were in almost total agreement. First, Mr. Marcus testified that existing transmission facilities were inadequate to accommodate the project, and that adding the project's output to the grid would exacerbate existing congestion at the Palo Verde hub even if anticipated facilities upgrades are completed. (1141:3-18.) This conclusion is based in part on the October 19, 2001 System Impact Study performed for the project by Southern California Edison and reviewed by the California ISO. (Exh. A-29.) That study found that the project would increase congestion and displace existing generation if permitted to connect to the grid. (1130:25 – 1131:2.) The study did not, however, consider the 8,000 MW of new generation currently proposed for the Palo Verde hub in its analysis. Mr. Marcus explained that had that additional generation been considered, congestion impacts would have been found even more severe. (1131:2-7.) Mr. Smith agreed. (1299:2-6.)

Mr. Marcus and Mr. Smith also agreed that future system upgrades required by Edison and/or the California ISO would not, by themselves, ensure the reliability of the system from the standpoint of Arizona consumers. (1141:17-18; 1203:24 – 1204:5.) As Mr. Smith explained, this is partly because neither Edison nor the ISO can be relied upon to maintain the integrity of the entire interconnected system that includes Arizona, since they are institutionally concerned only with their specific portions of

the system. (1302:3-7).[4] In addition, any facilities upgrades to accommodate the project would only serve to enlarge the already too large Palo Verde hub. Commission Staff had previously recommended a moratorium on new generation at Palo Verde based in part on security and safety concerns relating to its size. (1259:12-18.) The Palo Verde hub already is one of the largest commercial hubs in North America, yet, as Mr. Smith testified, it lacks any reliability criteria. (1259:19-22.) Concentrating transmission in one location in this manner does not make sense from a security standpoint. As Mr. Smith observed: "the question is how many eggs do you put in the basket, particularly when the basket is sitting on a three-legged stool." (1259:22-25.)

In sum, even if the project's output would contribute to reliability from an energy supply standpoint--which the facts show it would not--it would still impair overall reliability from an energy delivery standpoint, with or without system upgrades. (1134:1-5.)

C. The Project Will Displace Newer, Cleaner Powerplants From The Hub, Leaving Older, Dirtier Plants In Operation.

Mr. Smith also testified that because of the existing congestion problem at the Palo Verde hub, this project would displace other power plants from transmitting to the grid. The problem, however, is that the project would primarily displace newer, cleaner-burning plants, leaving older, dirtier plants in operation. (1347:9-17.) This, of course, will create additional unnecessary impacts on air quality. Mr. Smith agreed it was a fair characterization that the project could increase overall pollution emissions by increasing the likelihood that older, more polluting generation would be left operating while newer, cleaner generation was left stranded. (1411:14-25.) Accordingly, Mr. Smith also testified that building a project today that will not be needed for another ten years does not make sense from an environmental standpoint. Because pollution control technologies are continually evolving, there will likely be a new generation of power plant technologies available 10 to 20 years from now that are less polluting than the current generation of combined-cycle plants. (1131:6-25.)

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[4] As Mr. Smith warned, "until we have studies that look at the impact from a total integrated system, not just a California system perspective, that we will not have truly identified a transmission requirement to enable this project to proceed without having an adverse impact on other existing projects or future planned projects." (1203:24 – 1204:5.)

In conclusion, the record establishes that the La Paz project: (a) is not needed to ensure an adequate, economic, and reliable supply of energy, (b) will actually jeopardize the reliability of the existing and future energy supply, and (c) will displace new, clean-burning projects from the system, leaving older, dirtier plants in operation. There accordingly is no weight whatsoever on the energy supply side of the statutory balance.[5] In fact, Commission Staff ultimately urged the Committee to deny the CEC outright on grounds the project would pose an unacceptable risk to Arizona's transmission system. (1729:4-7.) AZURE did not seek denial, however, but rather urged the Committee to impose the array of conditions identified above, to avoid or minimize resource consumption and environmental harm. The following section addresses the other side of the balance, the public's interest in natural resources and environmental quality, and the means available to the Commission to preserve this interest if it chooses to approve this project.

III. THE PROJECT WILL UNNECESSARILY IMPACT THE HARQUAHALA AQUIFER AND WILL NEEDLESSLY CONSUME SCARCE WATER RESOURCES.

As approved by the Committee, the project includes a wet cooling system that would pump up to 6,500 acre-feet per year of groundwater from a small well field in the Harquahala groundwater basin. During Committee hearings, the applicant presented a "Water Supply Report" (Exh. A-5) concluding that, based on groundwater modeling, the project's water supply and aquifer impacts would be minimal. This is inaccurate. As discussed below, the record establishes that: (1) groundwater pumping could cause significant subsidence and/or drawdown impacts in the Harquahala aquifer, requiring the use of CAP water for recharge;[6] (2) that these adverse impacts could be avoided almost entirely, freeing CAP water for other beneficial uses in the state, if the project were dry cooled; and (3) dry cooling is technically and economically feasible for this project just as it is for other similar combined-cycle merchant plants throughout the arid West. Each of these points is discussed below in turn.

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[5] If there were such a thing as "negative weight," that is what would be on the "need" side of the scale.

[6] The Committee imposed a condition requiring the acquisition of CAP water for recharge purposes.

A. Drawdown And Subsidence Impacts Are Likely Significant.

Kenneth D. Schmidt, Ph.D., testified for AZURE regarding the project's impacts on the Harquahala aquifer. Dr. Schmidt holds a doctorate in hydrology from the University of Arizona, and has been conducting groundwater hydrogeologic work in the West for nearly forty years. (562:22-23; *see* Schmidt résumé, Exh. I-10.) He has performed over 200 aquifer draw-down determinations throughout Arizona, and has completed hydrologic studies in La Paz County specifically. (563:9-22; 564:15-25; 565:1-4.) He represents a variety of governmental and private sector clients, and has served as an expert witness in litigation involving groundwater matters, and has authored numerous technical publications on groundwater quantity and quality issues. (*See* Exh. I-10.)

Dr. Schmidt reviewed the applicant's Water Supply Report ("Report") and other relevant materials including USGS Survey Reports for the area, ADWR reports, and Harquahala Valley groundwater modeling reports prepared in conjunction with the nearby Vidler Recharge project. (566:1-16; 569:6-21.) In written testimony (Exh. I-9), and orally before the Committee, Dr. Schmidt described in detail how the applicant's Report was flawed in several critical respects, and that it could not be relied upon to conclude that the project would have no significant impacts on the aquifer. Specifically, Dr. Schmidt explained:

- Because drawdown and subsidence impacts are experienced most intensely in areas close to a pumping site, a proper impact evaluation must focus on the immediate area around the wells. (571:12-21.) The applicant's Report, however, focused on the Harquahala basin as a whole, examining areas 20 to 30 miles away. (*Id.*)

- The developers of the Harquahala groundwater model, which the Report relied upon for its conclusions, stated explicitly that it was "a regional model intended to represent hydrologic conditions on a basinwide scale, *not on a small scale*." (582:16-21, quoting from the model's documentation.) Thus, the model developers themselves warned that the model cannot be relied upon to predict localized impacts. The applicant, however, relied upon the model in precisely this manner. (582:16-21.)[7]

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[7] The applicant later obtained a letter from ADWR stating that ADWR had determined that the Harquahala groundwater model was "found to reasonably simulate the response of the regional aquifer to historic pumping stresses[.]" (Exh. A-21, at p. 1; emphasis added.) In a written response (Exh. I-20), Dr. Schmidt explained that he had not questioned the model's ability to predict regional impacts, but rather its ability to predict localized impacts, particularly in the area of this project – precisely what the model's developers warned it could not do.

- The Harquahala model developers also stated explicitly that one of the localized areas the model *could not represent accurately* was, in fact, the very same area where this project will be located. (584:1-7.)

- Because of the concentrated pumping in a relatively small area, localized drawdown and subsidence impacts could be significant. (Exh. I-9 at p. 7.)

- The Report failed to include any detailed evaluation of land surface subsidence, despite clear evidence of subsidence-prone clay in area overlaying the pumping zone. (Exh. I-9 at p. 7; 575:4-6; 15-19.)

- Subsidence is a potential problem because the project could create a greater groundwater level decline than has been experienced historically at the site. (591:4-7.)

- Important site-specific information on aquifer characteristics, necessary to determine drawdown and subsidence impacts, was never obtained from aquifer tests, as would be routine. (Exh. I-9 at p. 7.)

- Actual drawdowns from project-related pumping could be *twice as great* as estimated. (*Id.*; 586:23-25.)[8]

- An aquifer pump test would ordinarily be performed at the site of pumping in order to obtain accurate localized parameters for aquifer transmissivity and storage capacity, which are necessary to calibrate the groundwater model before running it. No such test was conducted in this case. (584:14-21.)

In sum, Dr. Schmidt's testimony establishes that the applicant's Water Supply Report is fatally flawed and cannot be relied upon to support any finding that the project's groundwater pumping will not adversely impact the aquifer.[9]

B. Dry Cooling Would Avoid Impacts To The Aquifer While Conserving Scarce Water Resources.

J. Phyllis Fox, Ph.D., P.E., testified for AZURE regarding the benefits and feasibility of dry cooling for this project. Dr. Fox holds a doctorate in Environmental Engineering from U.C. Berkeley,

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[8] While Dr. Schmidt acknowledged that impacts to other groundwater users in the basin would not be significant, he remained clear in his testimony that drawdown and subsidence impacts in the vicinity of the well field could be significant.

[9] The Committee imposed a condition mandating recharge of 60,000 acre-feet of water over the thirty-year life of the project, using Central Arizona Project ("CAP") water. While this may mitigate aquifer impacts to some extent, it provides no water conservation benefit at all. Furthermore, it is "subject to availability" of CAP water, which is by no means guaranteed.

and has over thirty years of experience in her field. (*See* Fox résumé, Exh. I-12.) Her experience includes work in Bechtel Engineering's power division, where she prepared preliminary designs and cost estimates for a wide range of infrastructure projects, including dry cooling systems and zero liquid discharge systems. (761:19 – 762:7.) More recently, Dr. Fox has performed preliminary engineering design and cost estimates of wet versus dry cooling systems for a number of merchant power plants in California similar to the La Paz project. (663:9-25.) Her work in conjunction with licensing proceedings for the Sutter Power project in California in part led that plant's developer to choose a dry cooling system. (763:12-14.)[10] Dr. Fox is a registered professional engineer in Arizona, is board certified as a qualified environmental professional by the Institute of Professional Environmental Practice, and has published over 75 articles on numerous topics in scientific and engineering journals. (662:1-17; *see* Fox résumé, Exh. I-12.) She is therefore manifestly well qualified to testify regarding the feasibility of dry cooling for this project.[11]

Dr. Fox explained that a dry cooling system would reduce this project's demand for water by 90 to 95 percent. (666:4-24.) A reduction of this magnitude would generate a number of environmental and resource conservation benefits. First, any impacts to the Harquahala aquifer, including the subsidence and drawdown impacts described by Dr. Schmidt, would be avoided almost entirely. Second, dry cooling would eliminate the needless consumption of freshwater in a desert environment, and would obviate the need to divert CAP water to the site for recharge purposes, leaving it available for other beneficial uses elsewhere. Furthermore, a dry system would entirely eliminate the visibility impacts associated with the steam plume from the project's wet cooling tower. (776:24 – 777:5.) Power

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[10] The applicant made much of Dr. Fox's never having designed an actual power plant cooling system herself. This is irrelevant, as the preliminary engineering cost-estimating work is routinely undertaken by engineers who do not eventually design and build the systems. This is standard throughout the industry. (874:6-12.)

[11] By contrast, the applicant's dry cooling witness, Mr. Wayne Micheletti, is not a registered engineer *in any state*. (1494:9-11.) He does not have an advanced degree in mechanical or electrical engineering, and has never designed, built, or operated a dry cooling system for any combined cycle power plant. (1495:1-2.) He has never used GT Pro, GT Master, or Thermoflex software to design and optimize the design of a combined cycle power plant for dry cooling. (1495:7-11.) He is a co-author of a report submitted to EPA on behalf of a utilities lobbying group called the "Utility Water Act Group," opposing the identification of dry cooling as the "best technology available" for minimizing impacts of once-through cooling systems on aquatic resources. (1496:3-5.) His testimony is based solely on a report comparing the costs of dry versus wet cooling *in general*. He did not perform an engineering cost analysis for the La Paz project.

plant steam plumes often rise several hundred feet in the air, and are frequently a plant's primary aesthetic impact. In addition, although dry systems emit marginally more air pollutants as a result of slightly increased fuel combustion to power cooling fans,[12] they actually reduce emissions of haze-producing particulates (PM10) from "cooling tower drift," *i.e.*, particles contained in the steam plume from a wet system. (686:16-17.) This in turn would reduce the formation of haze in several wilderness areas near this project's site, an additional impact discussed later in this brief.

In sum, dry cooling would: (1) save water which Arizona cannot afford to waste; (2) avoid harm to the Harquahala aquifer; and (3) reduce emissions of haze-forming particulates, preserving air quality and visibility in nearby wilderness areas. (*See* further discussion of visibility impacts, below.) Significantly, the applicant never denied that dry cooling would accomplish these benefits. Instead, it objected to dry cooling solely on economic grounds, arguing that its capital and operating costs were unacceptably high. As discussed below, however, the applicant's estimates of the cost of dry cooling are grossly over-inflated. Dry cooling is economically feasible for this project just as it is for other similar projects in California and Nevada.

C. Dry Cooling is Feasible For This Project.

In response to Committee member Williamson's request for information on the cost of dry cooling, the applicant solicited cost estimates for a dry cooling system for the project from some of the engineering contractors from whom it had previously requested bids to engineer the entire project. (*See* requests, Exh. I-19.) The estimates received in response ranged from $40 million to $58 million more than the cost of wet cooling. (248:22-23; Exh. I-19.) Based on these high figures, the applicant concluded that dry cooling was not economically feasible for the project.

Dr. Fox testified that these estimates were "unreasonable," and in fact were the highest she had ever seen in her thirty-year professional career as an engineer. (667:19-23.) She explained that these figures did not reflect the true cost of dry cooling for several reasons. First, neither the applicant nor the contractors had optimized the project's steam turbines and other systems for dry cooling. (668:3-24.) This would have produced substantial cost savings, primarily because steam turbines optimized for dry

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[12] Criteria pollutant emissions can be significantly reduced using LAER. (*See* further discussion below.)

cooling systems are less expensive than those for wet systems. (*Id.*) Furthermore, the estimates did not reflect the substantial costs associated with a wet cooling system that would be avoided with dry cooling, *e.g.*, costs of land for water rights, well construction, pumping, pipelines, evaporation ponds, etc. (671:12-24.) In other words, Dr. Fox explained, the applicant did not present the Committee with a true cost differential between a dry-cooled project and a wet-cooled project. Instead, it had asked the contractors to "provide an option price or price adder to your proposal for the installation of air-cooled condensers in lieu of cooling towers." (*See* request letters, Exh. I-19; emphasis added.) By requesting an "option price or price adder," however, the applicant only obtained estimates of the additional cost to build the same project, with the same steam turbines, same evaporation ponds, same water pumping systems, etc., even though these items would be not be needed with a dry cooled project. (813:4 - 814:25; 819:7-11.)

After establishing that the applicant's dry cooling cost estimates were inaccurate and misleading, Dr. Fox presented her own preliminary engineering design cost estimates for three cooling options for the project: wet cooling, dry cooling, and parallel wet-dry cooling. (Exh. I-18, I-18A.) Unlike the applicant's, Dr. Fox's analysis accounted for the savings that would accrue from using a less expensive steam turbine for the dry system, and from eliminating the need for land for water rights, well-digging, piping and pumping, water treatment systems, evaporation ponds, and aquifer protection permitting costs. For each cooling system, Dr. Fox presented data on performance efficiency, environmental issues, maintenance, and overall cost. (Exh. I-18A; 767:3-12.) She based her cost estimates on actual cooling system vendor quotes, on estimates provided by other power plant developers in power plant proceedings in California, and on similar cost estimates adopted in cooling system cost analyses by the U.S. Environmental Protection Agency.[13] Dr. Fox thoroughly documented all her sources in footnotes or attachments to her analysis. (*See* Exh. I-18A.) This stands in stark contrast to the applicant's cost estimates, which are almost wholly unsupported.

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[13] Dr. Fox obviously had no access to detailed cost information specific to this project. Her estimate is therefore precisely that: an estimate. It is, however, sufficient to approximate the additional cost of dry cooling and thoroughly discredit the applicant's grossly overstated figures.

Dr. Fox's engineering cost analysis repudiates the applicant's cost estimates on several counts. The key points and conclusions from Dr. Fox's analysis are:

- The total capital cost of the project's wet system, including all appropriate cost components, is approximately $67 million; the total cost of a dry system is $78 million, and a wet-dry system $69 million. (783:4-8.) **Thus, the true cost difference between a wet and dry system is approximately $11 million** – far less than the $40 to $58 million claimed by the applicant.

- Dr. Fox's $78 million capital cost estimate for a dry cooling system is *virtually identical* to the $77.8 million estimate the applicant procured from its own engineering firm, Black & Veatch. (783:13-5; *see* Black & Veatch estimate, Exh. A-23.)[14] This suggests that Dr. Fox and the engineers at Black & Veatch relied upon similar assumptions and methodologies for their preliminary design cost estimates.[15]

- Dr. Fox's estimates for the wet system were substantially lower than Black & Veatch's, because Black &Veatch ignored the cost of land to secure the water rights, and other water supply infrastructure components. (783:18-22.)

- A dry system would increase the cost per megawatt hour of output by only $1.42 to $2.02. Black & Veatch estimated an incremental cost of $0.88 to $1.05. (785:10-16.) The incremental cost for a parallel wet-dry system is nominal, between $0.02 and $0.97 per megawatt hour. (785:16-19.)

- In terms of operating cost differentials, the additional cost of a dry system would be approximately $6.6 million per year over the wet-system base case, and only $600,000 more for parallel wet-dry. (Exh. I-18A, Summary Table 1.)

- Contrary to the applicant's testimony, the loss in net power output for dry cooling ranges only from 1.8 to 4.3 percent, and in a hybrid wet-dry system between 1.4 and 3 percent. These numbers are consistent with similar analyses done for other projects, including the Blythe project, a similar powerplant located just 60 miles west of La Paz, in the California Mojave desert. (Exh. I-18A, Table 1.)

- Total reduction in megawatt output for the La Paz project would be between 26 and 44 MW with dry cooling. (680:19-20.) This could be minimized by using "spray cooling," which sprays water on the dry system during the hottest days, or by converting to a hybrid wet-dry system. (727:4-16.)

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[14] The applicant's Exhibit A-23, the Black & Veatch estimate, indicates a total installed capital cost of $38.9 million per power block for a dry cooling system. The project has two power blocks, for a total of $77.8 million.

[15] Significantly, Black & Veatch did not do a complete system optimization for a dry system. Had they done so, there likely would have been further significant cost savings. (784:13-17.)

- Based on Harquahala Valley dry bulb temperature data available from the University of Arizona web-site, the hottest temperature of 115 F occurs only two hours per year; 110 F occurs 20 hours per year, and 100 F 90 hours per year. (Exh. I-18A.) The average annual temperature in the area is 72 F. The reduction in steam turbine capacity when the temperature is 115 F is about 12 percent; the reduction at 72 F is only 2 percent. (791:3-792:1.) Thus, the efficiency loss would not be significant for any significant period of time if this project were dry cooled. And again, the use of spray cooling could reduce efficiency losses on the hottest days.

In sum, the applicant's cost estimates, which are based on engineering contractor materials submitted in response to the applicant's request for a "price adder," are utterly non-representative of the actual cost differential of a dry versus a wet system. (823:3-6.) The analysis submitted by Dr. Fox, who has been performing such analyses for over three decades, is far more realistic. It is also supported by the plain reality that similar plants in similar environments are using dry cooling throughout the West, as described further below.

D. Other Power Plants Throughout The West Are Using Dry Cooling, Further Demonstrating Its Feasibility.

In addition to her project-specific cost analysis, Dr. Fox explained that dry cooling systems were widely used at power plants similar to the La Paz project, operating in similarly hot, arid environments. (673:12-18; 712:7-10.) Dr. Fox based her testimony on information obtained from dry cooling vendors (Exhs. I-4, I-5) and on the status of recent power plants either built, under construction, or in licensing proceedings in California, Arizona, and Nevada. (718:24 - 719:7.) The following table, which is culled from Dr. Fox's and Mr. Micheletti's testimony (*see* 1496:18 – 1498:24), as well as from a California Energy Report addressing dry cooling that was docketed in this proceeding,[16] shows how widely dry cooling is being adopted by the new generation of power plants:

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[16] California Energy Commission, *Draft Power Plant Cooling Options Analysis for the Potrero Power Plant Unit 7 Project* (Dec. 21, 2001); docketed January 2, 2002.

Dry-Cooled Combined Cycle Merchant Power Plants in the West.

Project	Size (MW)	Location	Status
Calpine Sutter	540	California	Operating
El Dorado	480	Nevada	Operating
Crockett Cogen	240	California	Operating
Duke Moapa	1,200	Nevada	Under Construction
Big Horn	575	Nevada	Under Construction
Otay Mesa	510	California	Licensed
Three Mountain	500	California	Licensed (hybrid wet-dry)
Apex	1,100	Nevada	In licensing
Arrow Canyon	575	Nevada	In licensing
Silver Hawk	570	Nevada	In licensing
Copper Mountain	600	Nevada	In licensing
Colusa	500	California	In licensing
Signal Peak	580	Arizona	Announced (on hold)

As the technology is adopted more broadly, power plant siting agencies in other states are evaluating dry cooling more intensively and recommending it as a means of reducing water usage. For example, the California Energy Commission staff recently issued a report (excerpted in Exh. I-8) that concluded:

> "due to the greater capital cost and efficiency penalty associated with dry cooling, the reliance on economic criteria will almost always favor wet cooling *and ignores long term reliability concerns as well as issues of protection of a limited resource*. The greatest emphasis . . . should be given to the use of dry cooling because, although more expensive, dry cooling significantly reduces facilities' water demand, removes a major siting constraint and ensures facility reliability during emergencies and droughts." (Exh. I-8; 730:22 – 731:8; emphasis added.)

In conclusion, even if the dry cooling is slightly more expensive, the Commission should still not base a decision on dry cooling solely on this marginal difference. AZURE submits that any project that is not needed, and that will impair system reliability, should not be allowed to consume 6,500 acre-feet per year of scarce freshwater resources unnecessarily, in a desert, when dry cooling is an established and viable alternative. If this project is to be permitted, it must be dry cooled.

IV. THE PROJECT'S EVAPORATION PONDS POSE A NEEDLESS RISK TO BIRDS AND WILDLIFE.

As approved by the Committee, the project will use sixty acres of evaporation ponds to dispose of cooling tower blowdown waste. Scott Terrill, Ph.D., testified for AZURE, both orally and in writing

(Exh. I-15), regarding the impacts of these ponds on birds and wildlife. Dr. Terrill holds a B.S. and M.S. in zoology from Arizona State University, and a doctorate in Avian Ecology from SUNY Albany. (*See* Terrill résumé, Exh. I-15.) A principal in the biological resources consulting firm of H.T. Harvey & Associates, Dr. Terrill has over 30 years of experience in biology and ecology, including seven years of research, surveys, and other studies throughout Arizona. (*See* Terrill résumé, Exh. I-15.)

Dr. Terrill testified that several bird species would likely use the project site for breeding. These include mourning doves, house finches, Gambel's quail, and Lucy's warblers. (920:2-4.) In addition, the ponds themselves would likely attract other species, including diving ducks, avocets, and stilts, for foraging as well as breeding. (895:22-25; 894:10-19.) Dr. Terrill then explained that water quality data presented by the applicant showed that the groundwater used for project cooling contained selenium at concentrations of 4.5 parts per billion ("ppb"). (890:12-13.) The EPA limit for chronic exposure to wildlife is 5 ppb, while the U.S. Fish and Wildlife Service's limit is 4 ppb. (890:13 – 891:1.) However, because the groundwater would be cycled through the cooling system several times before discharging to the ponds, selenium concentrations in the ponds would substantially exceed both the EPA and FWS limits by an order of magnitude. (891:7-14.)

Exposure to such high selenium concentrations causes serious health effects in birds, up to and including mortality. Dr. Terrill testified that even low levels of selenium can reduce the number of eggs hatched and produce gross deformities in embryos. (892:21 – 893:4.) At higher levels, selenium exposure leads to organ lesions and death. (896:24 – 897:1.) Thus, Dr. Terrill concluded, if avian species were exposed to and were to assimilate the concentrated selenium in the project's ponds, they would likely suffer adverse health and reproductivity. (897:10-15.) Dr. Terrill also testified that the ponds would be attractive to birds, particularly in this arid environment, creating a high likelihood of exposure. (Exh. I-15 at p. 2.)

Dr. Terrill acknowledged that mitigation measures, including those proposed by the applicant, can sometimes reduce the attractiveness of ponds to birds. Nevertheless, Dr. Terrill testified that mitigation can be problematic, and is never 100% effective. For example, if ponds are built steep and/or deep to make them less attractive to shore birds, as the applicant here has proposed, they may become more attractive to other species like diving ducks, avocets, and stilts. (894:10-19; 895:22-25.) Because

different species are attracted to ponds with different physical characteristics and different salinity levels, any "one size fits all" pond design mitigation approach is necessarily difficult. (906:8-12.) Thus, the applicant's proposal to build deep ponds with steep slopes will not completely avoid impacts. (934:10-17.) With or without mitigation, the ponds pose a threat to the state's birds.

A. Impacts To Birds And Wildlife Can Be Avoided With A ZLDC.

Dr. Terrill and Dr. Fox both testified that evaporation ponds are not necessary to dispose of cooling tower blow down, and that less environmentally damaging alternative means exist. The primary alternative is a zero liquid discharge crystallizer ("ZLDC") system. Essentially, a ZLDC system separates salts and contaminants from the liquid component of cooling tower blowdown waste, recycles the water, and leaves crystallized solids that can be disposed of in a land fill. (691:25 – 692:8.) Dr. Terrill stated that a ZLDC would be preferable to evaporation ponds, even with mitigation, because it would completely avoid exposing birds and wildlife to toxic constituents in the first place. (899:9-15.) In other words, if this project were to use a ZLDC *in lieu* of evaporation ponds, there would be no risks to birds and wildlife from exposure to high selenium concentrations. (900:3-8.) The applicant, however, refused to adopt a ZLDC on grounds it was too expensive. As shown below, this claim is simply disingenuous.

B. Other Power Plants And Industrial Facilities In The Region Are Using ZLDCs.

As with dry cooling, ZLDCs are becoming increasingly common at combined cycle powerplants elsewhere in the West. Dr. Fox testified that four recently approved projects in California--High Desert, La Paloma, Sutter, and Three Mountain--are all using ZLDCs. (692:11-22.) She testified further that at least five ZLDCs are also in use at industrial facilities throughout Arizona, including at the Salt River Project's Navajo Generating Station, the Four Corners copper smelting plant, and the Tucson IBM facility. (693:4-6.) As these facts suggest, there simply are no constraints, financial or otherwise, to the La Paz project's using a ZLDC *in lieu* of evaporation ponds to avoid unnecessary impacts to biological resources. (694:3-7.) Available information suggests that a ZLDC costs approximately $8.7 million installed. (806:16-21.) Since, according to the applicant, the evaporation ponds would themselves cost $6.1 million, the added cost to eliminate all adverse impacts to birds and wildlife is only $2.6 million.

Considering that this project is utterly superfluous anyway, this certainly is a small price to pay to preserve biological resources. Of course, if the project is dry cooled, evaporation ponds would be all but unnecessary.

V. THE PROJECT'S AIR POLLUTANT EMISSIONS WILL GENERATE HAZE IN NEARBY WILDERNESS AREAS, DEGRADE AIR QUALITY, AND IMPACT BIOLOGICAL RESOURCES.

As with any combined-cycle power plant, this project will generate emissions of NO_x, SO_x, CO, and particulates (PM10). The nature and extent of these emissions' impacts on local air quality depends in large part on the project's location. In this case, the project is uniquely situated amid no fewer than seven Class II wilderness areas. As discussed below, the project's impacts on visibility are therefore potentially quite grave. Its location in the desert also amplifies its impacts on biological resources.

A. The Project Will Impair Visibility In Nearby Wilderness Areas.

Mr. Steven Radis, M.S., testified for AZURE, both orally and in writing (Exh. I-14), regarding the project's visibility impacts. Mr. Radis is a principal in the international consulting firm of A.D. Little, Inc., holds a Master's degree in Climatology, and has more than 20 years of experience in preparing climatological and meteorological air quality studies. (*See* Radis résumé, Exh. I-14.) He testified that the project site was remarkable in that it was "completely surrounded by wilderness areas," and that in "almost any direction the wind blows the plume emissions from this facility would be transported over these wilderness areas." (949:7-10, emphasis added.) As a result, the project's visibility impacts warrant extremely careful consideration.

Mr. Radis prepared a visibility impact screening analyses following standard EPA guidelines. This analysis, including all its inputs and outputs, appears in Exhibit I-14, at pp. 1-20. The analysis showed that visibility impacts would exceed applicable federal criteria for acceptable visibility degradation in five of the seven wilderness areas. (949:16-23.) Mr. Radis explained that the practical consequence of this was that a person standing in one of these wilderness areas would see haze, would see less contrast between terrain and sky, and would not be able to differentiate the color of sky and terrain as well as they could if the plant were not there. (958:6-14.) Mr. Radis further testified that the applicant's own visibility analysis, which found no significant impacts, was performed incorrectly and

as a result misrepresented the project's true impacts. (957:15-18.) Regardless, the Commission should remain mindful of the project's potential to create haze in as many as seven wilderness areas as it carries out the statutory balancing of need and environmental protection.

B. NO_x Emissions From The Project May Impact The Sensitive Desert Ecosystem And Harm Endangered Desert Tortoises.

In addition to his testimony regarding the evaporation ponds, Dr. Terrill also described how nitrogen-based pollutant emissions from the project could adversely impact productive soils in the region's sensitive desert ecosystem. (907-910; Exh. I-15 at p. 5.) Dr. Terrill discussed how air pollutants containing nitrogen compounds, namely NO_x, ultimately deposit on soils where they can act as nutrients to spur the proliferation of non-native weeds. (907:15-23.) These non-native weeds can out-compete native plants that serve as food sources for desert species such as the endangered Sonoran and Mohave desert tortoises. (909:1-6.) In California, native food plants for the desert tortoise have been adversely affected by increased nitrogen loads from NO_x emissions. (910:2-4.) Thus, the project may impact biological resources not only with its evaporation ponds, but by its air pollutant emissions as well. Again, the Commission should be mindful of this as it considers whether to affirm the CEC.

C. Impacts From Air Pollutant Emissions Can Be Minimized With LAER.

The project's air quality impacts, including those described above, would be minimized if the Commission were to impose a condition requiring the applicant to limit air pollutant emissions to levels equivalent to federal LAER for all criteria air pollutants. AZURE and Committee member Williamson each proposed such a condition. By definition, a LAER condition would reduce the air pollution-related impacts described above to the maximum extent feasible. The applicant opposed such a condition, presumably also due to cost concerns. Considering this project's redundancy from a power supply standpoint, and in light of recent Commission decisions imposing a LAER requirement on other projects, there is simply no reason why such a condition should not be imposed here. If the project is to be approved at all, it must adhere to applicable LAER standards.

VI. THE PROJECT WILL POSE AN UNNECESSARY AND AVOIDABLE RISK TO PUBLIC HEALTH FROM THE TRANSPORTATION OF AMMONIA ON THE PUBLIC HIGHWAY SYSTEM.

The project requires aqueous ammonia for its selective catalytic reduction ("SCR") pollution control system. As a result, approximately 150 7,500 gallon tanker trucks per year would transport ammonia to the project site from suppliers in Coolidge and/or Chandler, Arizona, or in California, using the public highway system. In addition to his testimony regarding visibility impacts, Mr. Radis also testified orally and in writing (Exh. I-14) regarding the public health risks associated with the transport of ammonia in this manner. For the past 15 years, Mr. Radis has been preparing quantitative risk analyses evaluating impacts of accidental releases of chemicals like ammonia and chlorine. (944:20 – 945:2.) Mr. Radis and his firm have prepared numerous studies for regulatory agencies including the California Energy Commission and the South Coast Air Quality Management District, specifically in the area of ammonia transportation risk. (945:8-12; Radis résumé, Exh. I-14.)

Mr. Radis prepared a transportation quantitative risk analysis to evaluate the likelihood of injuries and fatalities resulting from an accidental release of ammonia during transportation to the project site. (Exh. I-14, pp. 21-43.) Following the methodology included in guidelines issued by the American Institute of Chemical Engineers, which are standard in the field, Mr. Radis considered the number of truck trips, the routes traveled, census data regarding population densities along those routes, and accident rates obtained from a national accident database. (960:21 – 961:1.) He then applied dispersion modeling to calculate how large the area impacted by a release would be. (961:10-20.) The analysis and its results are presented in full in Exhibit I-14. The analysis showed that the worst-case accident scenario, a spill in the Phoenix area, could result in multiple injuries, an impact considered more than *de minimis.* (963:4-24.) While Mr. Radis acknowledged that the overall risk of serious injury and fatality was low, it was still manifest.

Mr. Radis then testified that this risk was completely avoidable. It is not necessary to import aqueous ammonia by truck in order to supply the SCR system. One alternative is a urea-based ammonia delivery system. Sometimes referred to as "U2A," such a system extracts ammonia from urea stored in pellet or liquid form, on an as-needed basis at the project site. (978:14-22.) Power plants elsewhere in

the country, including two coal-fired plants owned by this same applicant, are or will be using such systems. (979:20-23.) The use of a U2A system, Mr. Radis testified, would obviate the need to transport ammonia to the project site by truck on the public highways, thereby eliminating all public health risks from potential accidents. (979:10-13.) Again, since this project is wholly unnecessary from a power supply standpoint, there is no reason to subject the citizens of Arizona even to a *de minimis* risk of injury. If the project is to be approved at all, it must use a urea-to-ammonia system.

VII. THE STATUTORY BALANCE IN THIS CASE TIPS DECISIVELY IN FAVOR OF MAXIMUM ENVIRONMENTAL PROTECTION AND NATURAL RESOURCE CONSERVATION.

The balancing requirement is in many ways the very heart of the siting statute. It recognizes that the public's interest in an adequate and reliable supply of electricity, which only power plants can fulfill, may conflict with the public's co-equal interest in preserving its limited stock of natural resources and protecting the quality of its environment. Where this occurs, the Commission must weigh these competing interests to determine whether the public's need for a particular power plant justifies the sacrifice of Arizona's environmental and natural resources. If the record shows that a proposed plant is necessary to ensure a reliable and economical energy supply for Arizona, then it may be appropriate to absorb some measure of impact on Arizona's public resources and environmental quality. By contrast, if the record shows a plant is not needed for reliability, then it becomes highly inappropriate to sacrifice public resources to support it.

The statute in effect assures that Arizonans will not be forced to compromise their air, water, and biological resources to subsidize speculative private ventures. Stated simply, the balancing requirement stands for the proposition that an unnecessary power plant should not consume public environmental and natural resources unnecessarily. Therefore, the Commission should not affirm the CEC without, at a minimum, requiring maximum feasible mitigation or avoidance of environmental impacts and resource consumption.

As documented above, the record shows beyond any doubt that the La Paz project is wholly unnecessary from a reliability standpoint, and that it will actually impair reliability to the detriment of Arizona consumers. The record also shows that the project, as approved by the Committee, will

needlessly consume water; will needlessly harm birds and wildlife; will needlessly impair the visibility and hence the very splendor of five wilderness areas; and will needlessly expose the public to some degree of risk from an ammonia spill. The record also shows, compellingly, that virtually all of these impacts can be minimized or avoided entirely simply by using the same measures that other combined-cycle merchant power plants, selling into the same competitive market, are using routinely.

Under these circumstances, the outcome of the balancing test could not be more clear: if the Commission is to approve this project at all, it should impose conditions to avoid the needless consumption of resources and degradation of the environment to the maximum extent feasible.

VIII. CONCLUSION.

For the foregoing reasons, AZURE requests the Commission to modify the CEC in this proceeding to add new conditions requiring: (1) use of a dry cooling system; (2) a ZLDC *in lieu* of evaporation ponds; (3) compliance with federal LAER for all criteria air pollutants; and (4) an on-site urea-to-ammonia generating system.

Dated: March 11, 2002.

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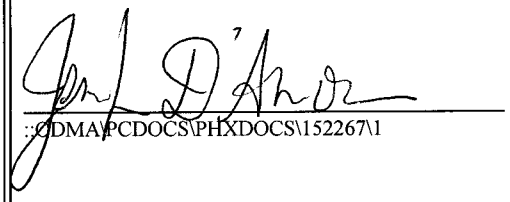

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